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Prime movers Stresses
Towing Coupling

19. ABSTRACT (Continue on reverse if necessary and identify by block number)

This TOP provides guidance for testing landing leg devices, leveling jacks which serve as landing leg devices, and towing compatibility of trailers with prescribed prime movers, to determine whether they comply with Operational Requirements Document (ORD), Development Plans (DPs), System Specifications, and other guidance documents.

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2.2 Instrumentation.

<u>Devices for Measuring</u>	<u>Permissible Error of Measurement*</u>
Weight	$\pm 0.5\%$ of reading
Dimensions/Clearances	$\pm 2\text{mm}$
Distance	$\pm 0.3\text{m}$
Time	$\pm 0.1 \text{ sec}$
Center of Gravity	$\pm 25\text{mm}$

*The permissible error of measurement for instrumentation is the two-sigma value for normal distribution; thus, the stated errors should not be exceeded in more than one measurement of 20.

3. REQUIRED TEST CONDITIONS.

3.1 Preparation for Test.

a. Review of Test Guidance.

(1) The subtests selected by the test agency are governed by requirements in the ORDs, DPs, other guidance documents, and by test directives from supervising agencies. The levels of acceptable performance are usually stipulated. If adequate test guidance does not exist, the test plan writer will make appropriate inquiries to the responsible directorate at TECOM.

(2) Review all additional reference material including the following:

- (a) Society of Automotive Engineers (SAE) Handbook.
- (b) Federal Motor Vehicle Safety Standards (FMVSS).
- (c) Federal Motor Carrier Safety Regulations (FMCSR).
- (d) Safety Assessment Report (SAR).

b. Safe Operations During Testing.

(1) All hazardous test operations must be covered by a Standing Operating Procedure (SOP) that will provide compulsory safety measures to be followed. If none exists, the test director must write one and staff it through the appropriate directorates and the Safety Office of the testing activity. Some typical operations that are categorized as hazardous are: longitudinal and side slope operations and lift and tie-down operations maneuvers.

(2) Safety measures for routine operations must be prescribed in local safety manuals.

(3) Lesser routine hazards must be covered by internal operating procedures.

c. Precluding Environmental Effects During Testing.

(1) Environmental measures for routine operations must be prescribed in local environmental codes.

(2) Examine potential for degradation of environmental quality. If impact is contemplated, assure that a suitable environmental assessment or categorical exclusion is performed.

3.2 Pretest Inspection. Inspect and lubricate the test item to ensure that all components function satisfactorily. Record any evidence of damage, defects in workmanship, construction or materials, and potential safety hazards. Guidance is contained in TOP 2-2-505², TOP 2-2-500³, and ITOP 2-2-500(1)⁴.

3.3 Test Loads. Unless otherwise specified, ensure that the vehicle is loaded with the cargo it is designed to carry or with a simulated payload of appropriate weight and distribution. At no time will explosives be present at the test site. Ensure that the payload is properly secured to prevent shifting. Determine the payloaded trailer's center of gravity (CG). Guidance is contained in TOP 2-2-801⁵, ITOP 2-2-801(1)⁶, TOP 2-2-800⁷, and ITOP 2-2-800(1)⁸.

4. TEST PROCEDURES.

4.1 Landing Leg Devices. Accomplish testing for landing leg devices in accordance with applicable system specifications. Typical specification requirements include, but are not limited to:

a. The ability to support the trailer/semitrailer under any load and on any grade specified. Tow the fully-loaded trailer into place and secure the landing device in position to support the uncoupled trailer.

b. The ability to lift the trailer/semitrailer to a height required for coupling to and uncoupling from the prime mover. Lower and raise the landing device to the proper coupling height.

c. The ability of the landing leg device to withstand stresses imposed during coupling or uncoupling. Visually monitor each operation.

d. The ability of the landing leg device to clear the ground, when in its stowed position, during cross-country operation. Visually inspect the device periodically during and at the end of daily operations.

4.2 Towing Compatibility. Accomplish testing for towing compatibility, using each designated prime mover, in accordance with instructions promulgated by the sponsor and integrated into a test plan by the test director. Typical requirements for towing compatibility include, but are not limited to:

a. Height and size compatibility of lunette and pintle. Measure both using standard measuring devices.

b. Turning limitations. Test in accordance with TOP 2-2-609⁹ and ITOP 2-2-609(1)¹⁰.

c. Interference on grades, side slopes and obstacles. Test in accordance with TOP 2-2-610¹¹, ITOP 2-2-610(1)¹² and 2-2-611¹³ and ITOP 2-2-611(1)¹⁴.

5. DATA REQUIRED.

5.1 Landing Leg Devices.

- a. Proper clearances for coupling and uncoupling prime movers.
- b. Structural integrity while supporting payloaded trailer. Record any bending, warping, twisting, or separation of structural components over the entire period of the test.
- c. Any interference with the ground during cross-country operation.
- d. Vertical distance from stowed position to position of maximum extension.
- e. Range of adjustment when extended.
- f. Capability of the landing leg device to remain securely in place when in the stowed position.
- g. Problems noted during operation.

5.2 Towing Compatibility.

- a. Height and size of lunette and pintle.
- b. Turning limitations.
 - (1) Interference points.
 - (2) Wall-to-wall, curb-to-curb, and inside rear wheel turning diameter.
 - (3) Maximum backing angle, left and right.
 - (4) Minimum road widths for left and right 90-degree turns (curb-to-curb and wall-to-wall).
- c. Problems noted during operation (especially while traversing cross-country courses).

6. PRESENTATION OF DATA.

- a. Tabulation of landing leg device data obtained during each subtest and, whenever possible, comparisons with established criteria.

b. Tabulation of compatibility test results and comparisons with the requirements and with a baseline vehicle when specified.

c. Audio-visual and still photographic coverage of all significant events.

Recommended changes of this publication should be forwarded to Commander, U.S. Army Test and Evaluation Command, ATTN: AMSTE-TC-D, Aberdeen Proving Ground, MD 21005-5055. Technical information can be obtained from the preparing activity; Commander, U.S. Army Combat Systems Test Activity, ATTN: STECS-DA-ID, Aberdeen Proving Ground, MD 21005-5059. Additional copies are available from the Defense Technical Information Center, Cameron Station, Alexandria, VA 22304-6145. This document is identified by the accession number (AD No.) printed on the first page.

APPENDIX A. BACKGROUND

Trailers and semitrailers. Trailers and semitrailers are nonpowered vehicles designed primarily to transport supplies and equipment. They range in payload capacity from 1/4 ton to 70 tons.

1. A trailer is a nonpowered wheeled or tracked vehicle with all or most of its weight supported by its own wheels or tracks. It is designed to be towed by a self-propelled motor vehicle. Typical trailers are used to haul ammunition, cargo, or electrical equipment. They can be readily attached to a prime mover for transporting to a different location. The trailer is connected by its lunette to the prime mover's pintle hook. An integral part of the trailer is the landing leg device that is designed to support the trailer under any load specified when not connected to its prime mover. The landing leg devices are usually a swing-up type and are vertically adjustable to allow for coupling to and uncoupling from its prime mover.

b. A semitrailer is a nonpowered vehicle designed so that a large part of its weight is supported by its connection to the towing vehicle (fifth wheel), the remainder being supported by the wheels of the semitrailer. An integral part of the semitrailer is the retractable landing gear which supports the front of the semitrailer when it is not connected to the prime mover. The landing gear shall be capable of raising or lowering the fully-loaded semitrailer for coupling and uncoupling.

c. Operational exigencies may require that a trailer be towed by a vehicle other than its designated prime mover. In the event this situation arises, information regarding trailer and alternate towing vehicle compatibility is essential.

APPENDIX B. REQUIRED REFERENCES

1. US TOP 2-2-020, Trailers, Semitrailers, and Dollies, 23 March 1973.
2. US TOP 2-2-505, Inspection and Preliminary Operation of Vehicles, July 1977.
3. US TOP 2-2-500, Vehicle Characteristics, 3 December 1981.
4. FR/GE/UK/US ITOP 2-2-500(1), Tracked Vehicle Physical Characteristics, 21 May 1982.
5. US TOP 2-2-801, Weight Distribution and Ground Pressure (Wheeled and Tracked Vehicles), 7 August 1981.
6. ITOP 2-2-801(1), Tracked Vehicle Weight Distribution and Ground Pressure, 15 May 1987.
7. US TOP 2-2-800, Center of Gravity, 18 July 1980.
8. FR/GE/UK/US ITOP 2-2-800(1), Tracked Vehicle Center of Gravity, 15 May 1987.
9. US TOP 2-2-609, Steering, 18 July 1980.
10. FR/GE/UK/US ITOP 2-2-609(1), Tracked Vehicle Steering, 18 May 1987.
11. US TOP 2-2-610, Gradeability and Side Slope Performance, 18 July 1980.
12. FR/GE/UK/US ITOP 2-2-610(1), Tracked Vehicle Gradeability and Side Slope Performance, 21 May 1987.
13. US TOP 2-2-611, Standard Obstacles, 25 June 1980.
14. FR/GE/UK/US ITOP 2-2-611(1), Tracked Vehicle Obstacles, 21 May 1987.